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Terrigenous organic matter input to the Black Sea originating from different hinterland regimes

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The Black Sea as the world's largest anoxic basin has been shown to be a significant sink of terrigenous and phytoplankton derived organic material. The north-western part is dominated by a large shelf area, while in the SW and E Black Sea, steep slopes plunge into the anoxic zone at short distances to the shore. Major rivers draining into the Black Sea include the Danube River, the Dniester River, the Kuban and the Don River. These rivers and their tributaries transport huge amounts of suspended load to the Black Sea, eroded from mountain ranges including the Alps, the Carpathian Mountains and the Caucasus Mountains. However, the size, climate and ecology of the respective drainage areas and the near-shore topography differ substantially between the rivers.

We show geochemical proxy data, bulk radiocarbon (^{14}C) ages and compound-specific ^{14}C ages of terrigenous biomarkers from core-top samples collected along three sample transects in front of the Danube and the Dniester river mouths in the NW Black Sea off Rumania and Ukraine, draining the Alps and the Carpathian Mountains, and just south of the Strait of Kerch, connecting the Black Sea to the Sea of Azov (drainage of the Caucasus Mountains). Two further core locations are situated in front of the Çoruh and Acharistsgali river mouths in the SE Black Sea off Georgia (Eastern Pontic Mountains) and north of the Gülüç and Çatalağci river mouths in the SW Black Sea off Turkey (Western Pontic Mountains), respectively. The samples range from the oxygenated surface waters to the anoxic deep basin and form transects along specific transport pathways.

The Branched and Isoprenoid Tetraether index (BIT) is used to trace the terrigenous organic matter in marine sediments, and it is thought to represent mainly soil-derived materials. BIT-values show the expected pattern of high terrigenous input in front of the river mouths and decreasing values further offshore along the sampled transport trajectories. Proxies indicative of organic matter derived from higher land plants exhibit corresponding patterns: Average chain length (ACL) of high molecular weight hydrocarbons (n-alkanes) ranges from 29.06 to 29.79, and n-alkanes show a typical odd-over-even-predominance. This is illustrated by the Carbon Preference Index (CPI) values, which vary between 4 to 7 at the Western Black Sea stations, typical for "fresh" terrigenous material. CPI values from the Eastern Black Sea core locations show a range between 3 to 4, which indicates either enhanced marine phytoplankton-derived input, or potentially a slight oil contamination due to oil seepage in that area.

Carbon to nitrogen (C/N) ratios, which range between 7-10 at all stations, also reflect input of terrigenous organic matter defined by less molecular nitrogen compared to marine organic matter. For the Western transects C/N ratios are decreasing from the stations close to the river mouths towards the offshore core locations, but show increasing values towards the anoxic stations again. This might be explained by an influence of the quasi-permanent Black Sea rim current, probably partly eroding terrestrial organic matter.

Conventional ^{14}C ages of total organic carbon correlate well with the BIT index values. Highest ^{14}C ages of 1410±20, 1350±30 and 400±30 ^{14}C years are observed in front of the river mouths, indicating an input of pre-aged terrigenous organic matter. The radiocarbon contents are increasing further offshore along the transects with modern ^{14}C ages (bomb-^{14}C contribution) at those core locations where organic matter is dominated by marine production. For a core south of the Strait of Kerch, where compound-specific ^{14}C ages of terrestrially derived long-chain fatty acids (FA) are available, our results show increasing ^{14}C ages with increasing chain-length from n-C_{24} (post-1950 values) and n-C_{26} (654±110 ^{14}C years) to n-C_{28} and n-C_{30}-FA (1092±110 ^{14}C years), probably indicating higher resistance to degradation. TOC ^{14}C ages and radiocarbon ages of n-C_{26}-FA (1000±30 and 907±140

^{14}C years) and n-C_{28}-FA (767±30 and 768±120 ^{14}C years) of two cores from the SW and NW Black Sea agree well, confirming the presence of pre-aged terrestrial material. The n-C_{26}-FAs are slightly younger (400 ^{14}C years) than the n-$C_{28}$and n-C_{30}-FAs, but are older than marine biomarkers (bomb-^{14}C contribution). In our presentation, we will discuss the implications of our observations for the timescales of transport affecting terrigenous organic matter.